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The Role of Personality and Situational Variables in Predicting Decisionmaker Behavior

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Abstract

Predicting a leader's actions must take the Subject's personality into consideration in addition to relevant situational variables. This paper presents a methodology for prediction that enables the analyst to reason through a prediction of a Subject's decision making, to identify assumptions and determinant variables, and to quantify each variable's relative contribution to the prediction, producing a graphical representation of the analysis with explicit levels of uncertainty. The analyst builds Bayesian networks that integrate situational information with the Subject's personality and culture to provide a probabilistic prediction of the hypothesized actions a Subject might choose. The model development process allows the analyst to systematically develop hypotheses regarding potential actions, determine the Subject's most likely strategic objectives, identify relevant situational variables, estimate probabilistic relationships between variables, and assess the Subject's standing on several personality variables. The analysis forecasts probabilities of hypothesized actions, which may then be subjected to several "what-if" and sensitivity analyses. The methodology has been applied to over a dozen historical and prospective situations.

Introduction

One generalization that can be made about intelligence analysis is that it involves activities in which members of one group of people – analysts – make predictions about the activities of members of another group of people – foreign leaders or other decisionmakers. The decisionmaker determines the course of action to take, considering his or her objectives as well as a variety of situational constraints in a way that reflects his or her personality as well as cultural norms. The analyst must identify the relevant situational variables, specify the personal characteristics of the decisionmaker, and forecast how these factors interact to determine the chosen action.

Personal characteristics of the analyst may make it more or less difficult to produce an accurate prediction. Many cognitive limits and biases in prediction are both well-known and widely shared among both trained and naïve analysts. These biases – such as recency, halo, proximity, hindsight, and personalization – can produce systematic errors in predictions. In addition, prediction is often undertaken by a team of analysts with diverse backgrounds, working on a problem that will evolve over weeks or months and need periodic reporting. Consequently, the analysis process is subject to less widely discussed but influential social biases, such as those reflected in giving undue weight to the senior expert, the "party line" or published record, the analyst with the biggest fistful of cables, or with the most dazzling personality.

This paper describes an effort to develop tools that can assist analysts in making reasoned predictions about what key figures might do in specific situations. This effort, underway since 2001, addresses many of the concerns in recent critiques of the national intelligence process. The key purpose of our work is to create a method for modeling/predicting leader actions.

The following principles were the basis of this development effort:

- Viewpoints – the more the merrier, but make it systematic (combine many analysts with varying expertise, addressing both the situation and the subject's personality and culture, and use a rigorous analytical method for integration);

- Intelligence as a process, not just as product – recognizing that intelligence consumers are their own analysts, engage the customer by using the model to manage the debate and questioning that often ensues when an analyst briefs a policy-maker – the modeling process enables different assumptions or alternative hypotheses to be tested on the spot;

- Continuous and real-time updating of the model – review and quantify relevant evidence and the associated probabilities for specific model variables, and explicitly inform the user when data may warrant changing judgments.

The paper describes the methods we have used to predict leader actions, based on a combination of situational variables and an assessment of the leader's personality. First, it describes the Bayesian network methodology that forms the basis for forecasting leader actions. This methodology specifically addresses some of the individual cognitive biases that can degrade the quality of predictions. Second, the paper describes some of the most relevant research results that link a leader's personality to his or her actions and shows how these can be represented in the Bayesian framework. Third, it describes the process that we have used with groups of analysts to develop Bayesian models to understand historical events and to predict future actions. We believe that this development process, along with the underlying methodology, can reduce the impact of social biases on the accuracy of predictions. Finally, the paper summarizes the status of our work and describes some future directions that it may take.

Modeling Method

Forecasting is mankind's attempt to guess at what the future will be like. Domains in which forecasting is important involve the weather for farming and human activities; business ventures such as how well will our new product do and when will competition launch a new product, how much will it cost, and how will it compare to existing products; and governmental activities such as what is an enemy doing and how much will a new social program cost and how will it perform. Mankind has used the stars (astrology), experts (subject matter experts and soothsayers), and mathematical statistics to perform forecasting. There is great room for improvement in both the art and science of forecasting.

Common scientific methods for forecasting include role playing, obtaining and combining expert opinions, using analogies, extrapolating from historical data, building rule-based models that operate on recent and current data, using statistical models that involve time series or cross-sectional data, and various combinations of these methods. Armstrong (2001) provides the methodology tree of possible forecasting methods shown in Figure 1. Our use of Bayesian networks described in this paper fall under judgmental – using others – structured – limited feedback (Delphi, Decomposition, Judgmental bootstrapping).

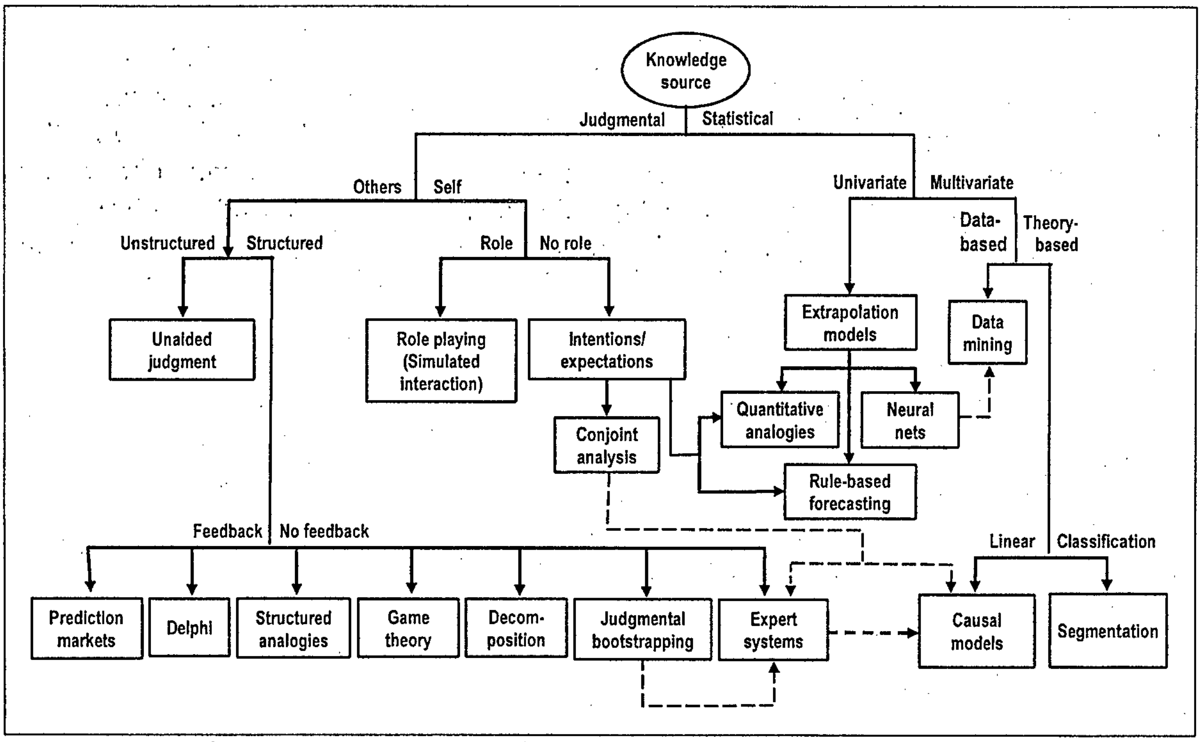

Figure 1. Tree of Forecasting Methods (from Armstrong [2001])

The general problem of predicting someone's future action is exceedingly complex. Without even considering the task of identifying the determinative variables correctly, one must deal with uncertainty, human judgment about the problem logic, relative strength of specific variables and evidence, and the dependencies of some variables on others. When we add the requirement to enable updates to the prediction as new information becomes available, we realize there is only one method that matches the problem statement – Bayesian probability (Schum 1994).

Recent advances in computer science and operations research have created Bayesian networks (Pearl 1988; Shachter 1988). Bayesian networks provide a graphical representation of the problem, using an acyclic directed graph to show the variables as nodes, the probabilistic dependence as arcs, and probabilistic independence as the lack of arcs. Conditional probabilities are captured inside the nodes. Sophisticated message passing algorithms are used to update the probabilities at all nodes based on evidence at several nodes (Buede 2001).

Application of this modeling method provides a natural mechanism for surfacing assumptions, logic, and new evidence for the team working the problem. In addition, modeling software can capture an auditable history of the team's thought process and supporting evidence. This software solution alerts the analyst when certain thresholds are met within the model, indicating that the evidence may warrant changing one's beliefs.

There is some similarity between this approach and Alternative Competing Hypotheses (ACH; Heuer 1999). In both our approach and ACH, a list of possible hypotheses is developed. Next, a set of possible indicators is brainstormed; these indicators, if true, would favor one hypothesis over the other. At this point the methods diverge. The ACH elicits qualitative statements (e.g., 1 to 3 pluses or 1 to 3 minuses) to capture the strength of the relationship between the hypothesis and each indicator. The Bayesian approach quantifies the conditional probability of the indicator given each of the hypotheses. With ACH, the result is a summary of the pluses and minuses associated with each hypothesis for identified indicators. The result of a Bayesian network is the posterior probability of the hypotheses given the identified indicators. The Bayesian approach can also incorporate causal factors that condition the probability of the hypotheses, address interactions between the indicators, and report uncertainty associated with the indicators and causal factors..

Another approach that has seen lots of applications in the last decade is the Situational Influence Assessment Module (SIAM; Rosen & Smith, 1996). SIAM is used to compare alternate scenarios of causal factors (rather than indicators) for creating some desired or undesired outcome (hypothesis). A SIAM model looks like a Bayesian network in which there are many arrows entering a few nodes. In true Bayesian networks, this approach produces the need for an unmanageable number of conditional probability distributions. Using approximations involving labeling causal variables as promoters and inhibiters, SIAM reduces the number of conditional probability distributions to a manageable level. These independence assumptions must be considered carefully on a problem basis when judging the applicability of SIAM.

Representing Leader Personality

A substantial body of research recorded in both the psychology and political science literature has focused on the cognitive processes leaders use to perceive and understand the political environment, predict the actions of adversaries, generate and evaluate courses of action, make and implement decisions, and receive and process feedback on the outcome of these decisions. This research has placed bounds on the rationality of human actors (Simon, 1957; Rosati, 2001) and has documented heuristics and their concomitant biases in perception (Jervis, 1976), understanding of uncertainty (Kahneman, Slovic, & Tversky, 1982), and social judgment (Nisbett & Ross, 1980). This research indicates that a leader's perceptions of the situation may be a more potent predictor of action than objective reality. It also suggests that methods to forecast leader policy decisions should consider such factors as beliefs, cognitive capacities, personality, and response propensities.

Hermann (1999) has attempted to characterize the interactions among several personal variables related to the actions of political leaders: (a) Belief that one can influence or control events, (b) need for power, (c) conceptual complexity, (d) self-confidence, (e) task focus and problem solving vs. relationship building, (f) general distrust and suspicion, and (g) ingroup bias. These variables were combined to define leadership styles organized around the following three questions.

1. How do leaders react to political constraints in their environment? Do the respect or challenge them?

2. How open are leaders to incoming information? Conversely, how selective are they in their use of information to guide their actions?

3. What are the leaders' reasons for seeking their positions? Are they driven internally or by relationships with their constituencies?

For example, according to Hermann (1999) leaders' reactions to political constraints are determined by their belief that they can control events and their need for power. Individuals who are high in both of these traits are more likely to challenge constraints that the political environment places on them. Conversely, individuals who are low on these traits will tend to respect constraints. Individuals who are high in one trait, but low in the other will also tend to challenge constraints, but may not be as comfortable or successful in doing so.

Psychological research has demonstrated that personality variables describe differences between individuals on both cognitive and non-cognitive dimensions. Although there are many potential attributes that can characterize individual differences, a substantial body of research has shown that five general personality dimensions can summarize most of these traits. In a review of the literature on personality structure, Digman (1990) summarized the growing concurrence within the psychological community regarding opinions concerning the structure of the concepts of personality, as well as in the language of personality. Early efforts to define a taxonomy of personality attributes have let to the development of a general structure that has unified several earlier theories. The result of this research, termed the five-factor model of personality, provides general personal variables with the potential to predict behaviors that are of interest to this project.

The five-factor model reflects the relationships among the most commonly used psychological dimensions. Factor analysis of these measures resulted in the identification of a common five-factor solution. These are the five factors which when taken together they provide a good approximation of what personality structure represents.

- *Extraversion.* Extraversion is characterized by a social rather than a misanthropic personality. The extravert is outgoing rather than introverted and expresses confidence rather than timidity.

- *Agreeableness.* This factor is indicated by general friendliness, rather than indifference to others. The agreeable individual is docile rather than hostile and is compliant to others' wishes.

- *Conscientiousness.* Conscientiousness is the most ambiguous of the five factors. It can be seen as educational achievement or as will or volition.

- *Neuroticism.* This factor reflects anxiety and dependence, rather than adjustment or independence. The scale for this factor is often reversed so that the factor assesses emotional stability.

- *Openness.* Openness is a reflection of an inquiring intellect. Individuals who are high on this factor tend to be flexible and rebellious, rather than conforming and subdued.

Our approach to account for leader personality combined these two approaches from political science and psychology. After a detailed review of the personality literature and a consensus session with some of the leading researchers, we identified the following variables from the political psychology literature: positive image of others, internal locus of control, need for power, conceptual complexity, general distrust and suspicion, and acceptance of risk. (Sticha *et al.* 2000) From the personality researchers within psychology, the emphasis was on the five-factor model (Costa and McCrae, 1985). Our early attempts at model building demonstrated that the leadership analysts were more familiar and comfortable with the concepts from political science than the five-factor model. However, the five-factor model has substantial research backing it up, as well as validated assessment instruments. In an effort to synthesize user acceptance and empirical foundations, we decided to integrate the two sets of personality factors.

Psychologists at HumRRO related the 30 facets from the five-factor model of personality to the six leadership variables from political science/political psychology. The facets are the second tier elements of the five-factor model; each of the five factors has six facets. Table 1 shows the relationships established between the two models. A minus sign (-) to the left of a facet indicates an inverse relationship between that facet and the corresponding leadership variable.

The second major element of the personality model is the incorporation of data and associated error. There are several ways to report and assess data. The NEO (a commercially available personality test with a form for knowledgeable informants) is a well-known, validated measure of the facets. Profiler+ (Young, 2001) is a content-analysis approach that analyzes first-person verbalizations according to Hermann's (1984) personality theory of leadership. Finally, HumRRO psychometricians developed a short, third-party evaluation form based on our variables. The estimated error of each kind of assessment is considered in the model.

Table 1. Linkage Between Two Personality Models

Political Psychology	Facets from 5-Factor Model
Positive Image of Others	Positive Emotion (Extraversion) Trust (Agreeableness)
Internal Locus of Control	(-) Vulnerability (Neuroticism) (-) Depression (Neuroticism) Assertiveness (Extraversion) Competence (Conscientiousness) Self-Discipline (Conscientiousness)
Need for Power	(-) Compliance (Agreeableness) Achievement Striving (Conscientiousness) Assertiveness (Extraversion)
Conceptual Complexity	Openness to Ideas (Openness) Openness to Values (Openness) Openness to Actions (Openness)
General Distrust & Suspicion	(-) Trust (Agreeableness) Angry Hostility (Neuroticism) (-) Warmth (Extraversion) (-) Compliance (Agreeableness)
Acceptance of Risk	Openness to Actions (Openness) (-) Anxiety (Neuroticism) (-) Deliberation (Conscientiousness) Excitement Seeking (Extraversion) (-) Vulnerability (Neuroticism)

The third major element of the personality model specifies how it should be connected to specific hypotheses about leader actions. To make this connection, we created a set of intervening variables from the political psychology literature that help express the relationship of traits to actions. The following six intervening variables link actions to personality, in that they can be considered to be both action characteristics and behavioral proclivities.

- Conflict versus cooperation (regarding opponents);
- Follow through required versus not required;
- Consistent with position versus not consistent;
- Unilateral versus collaborative (regarding colleagues);
- Substantive versus protocol; and
- Challenges constraints versus no challenges.

HumRRO, along with Intelligence Community psychologists estimated the quantitative relationship between the personality traits and the six behavioral proclivities; these correlations are embedded in the model. When we model a particular decision, we draw dependencies between hypothesis (decision) node and the action characteristics, thus specifying which proclivities are relevant to the decision. The process recognizes that not every proclivity relates to a particular set of hypothesized actions.

Model Implementation Process

We have developed models in two-day, facilitated meetings attended by analysts, model developers, and external subject-matter experts. The facilitator guides the participants through the steps in the development process (described in the following sections), elicits estimates of model parameters, and ensures that the requirements of the methodology are met. A second member of the modeling staff implements the model on the computer and takes notes. The model is projected onto a screen during the development process so that all participants are aware of the variables and relationships included in it. Both analysts and external experts provide the information and assessments that are incorporated into the model. The analysts usually provide critical information about the questions to be addressed by the model, while all participants provide the regional and Subject knowledge incorporated into the model.

The analysts' intelligence questions, the optional outcomes of interest – what will X do or what can we do to lead X to do Y – are debated at considerable length. The process in 2.3 below usually takes four hours at the outset of a two-day session and sets the motif – and some social norms – for the rest of the session. The mix of staff and outside panelists suggests that diversity of opinion and experience is desirable; it gives the staff permission and cover for bringing new or divergent views to the table.

The facilitator's behavior is critical in two respects. First, the technical aspects of applying Bayesian analysis must be guided by an expert – the international relations and political science educations of most analysts don't prepare them for this methodology. The challenges of helping the group to frame questions properly – consistent with probability theory – and to keep their engagement fresh while estimating large conditional probability tables are not trivial items. In addition, the facilitator helps to keep the gate open to contrary data and judgments and healthy debate, to elicit contributions from all members, to challenge what everyone takes for granted, and to curb the natural tendencies of dominant actors to hog the stage and dictate the analysis – all while demonstrating respect for each contribution.

As the session proceeds and the facilitator leads the team through identifying the key determinative predictors and indicators of the situational variables, much debate about key variables ensues. Projecting the model on a screen as it is being developed provides a way to focus the discussion on specific issues, data, and opinions, while avoiding unproductive *ad hominem* debates. In addition, it may provide an environment that can encourage greater participation from reticent analysts. Consensus may not be feasible, but the model makes it possible to locate specific areas of agreement and disagreement and to determine the implications of this disagreement on the outcome of the model. Where there is disagreement about critical model variables, the areas of disagreement can be used to specify the requirement for additional intelligence collection.

Throughout the session, a note taker records choices, issues and rationales for decisions to be included with the model as a history, which can help future users understand the logic underlying the model. At the end, we invite the group to review the model after a day or more – a process that can iron out wrinkles and spot deficits. Of course, many other social dynamics are managed in this process, but these are the highlights.

We now illustrate the model development process with a hypothetical example. Although based on the analysis of an actual event, key elements and assessments of the model have been changed so that it may be presented in an unclassified format. The description covers five steps in the model development process: (a) defining the question, (b) modeling the situation, (c) adding personality, (d) performing "what-if" analyses, and (e) assessing sensitivity of variables.

Defining the Question

The Subject's decision, for instance, to launch an attack is not simply yes-no, but whether to make a contingent attack, one involving certain levels of force, on certain days, against certain targets, or seeking certain outcomes, or may weigh attacks versus warnings or other public acts. These alternative competing decisions represent the analyst's best estimate of the choices considered by the Subject. We have on occasion used between one and four variables, each having two to six states to define the possible prediction of a key figure's decision. These states (in each variable) need to be mutually exclusive and collectively exhaustive. Clearly, when trying to predict the future by using a discrete number (4 to 4^4) of states, we must interpret mutually exclusive and collectively exhaustive loosely. For the sample problem being used in this paper, we address a situation in which a leader must decide what to do when beset by a national strike organized by his opponents. The states defined by the intelligence analysts were:

- Leave the country;
- Make concessions to end the strike;
- Hold a voter referendum in agreement to end the strike;
- Allow a regional organization to arbitrate the strike;
- Wait out the strikers; or
- Repress the strikers using violence when necessary.

We also define the leader's strategic objectives and develop a probabilistic relationship between the objectives and the hypothesized actions (see Figure 2). The leader's objectives typically range from "staying alive" to "becoming an international power". These states for the leader's objectives are clearly not mutually exclusive so we define the objectives variable to be the *primary* objective of the leader.

The two boxes in Figure 2 represent variables (or nodes) that may take one of several values (or states). The arc from Leader's Objective to Leader Decn in Sec Event establishes that there is probabilistic dependence between these two variables.

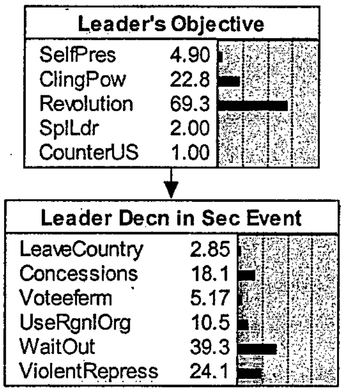

Figure 2. Hypotheses and Objectives

Modeling the Situation

When a model is being developed, significant effort is made to identify possible situational variables that might change the outcome of the leader's decision. Once the possible situational events have been discussed and prioritized, key events are picked and added one at a time. After each variable is added, we conduct several "what if" analyses (changing situational outcomes) to see if the "model" makes sense in these different situations. When these analyses reveal errors or inconsistencies in the predicted probabilities, appropriate changes are made to the model. Additional variables are added subject to the time constraints for the model development process. Figure 3 shows the national strike model with the added situational variables (one-and-a-half days of the two-day session are typically completed by this point.)

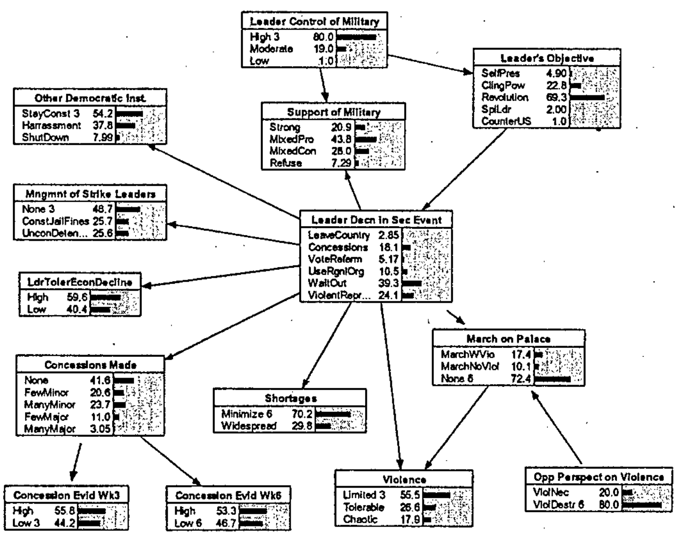

Figure 3. Model with Situational Variables

To develop the Bayesian network, it is necessary to represent the dependencies between variables by conditional probabilities. Table 2 shows the conditional probability table for one variable – Mgmt of Strike Leaders. There are similar tables for every node/variable in the model.

Table 2. Conditional Probability Table –
Probability of Mgt of Strike Leaders given Leader Decn

	Mgt of Strike Leaders		
Leader Decn	None	ConstJailFines	UnconDetent
LeaveCountry	0.90	0.01	0.09
Concessions	0.60	0.30	0.10
VoteRefern	0.50	0.30	0.20
UseRgnlOrg	0.75	0.20	0.05
WaitOut	0.60	0.30	0.10
ViolentRepress	0.05	0.20	0.75

Figure 4 shows the updated probabilities after 3 weeks have elapsed, a number of intel reports have been received, and the values of some of the situational variables are known with near certainty, as shown by the shaded nodes in the figure.

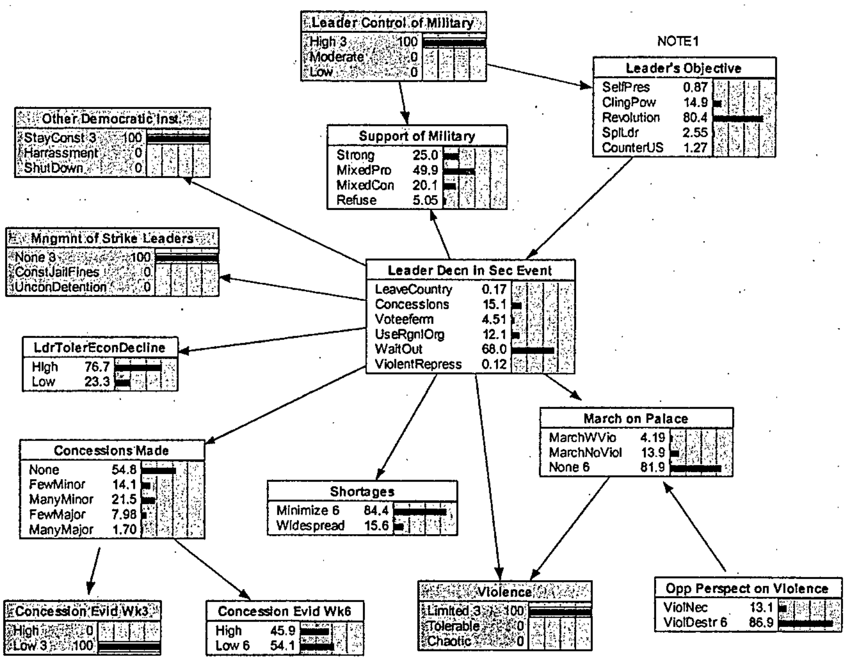

Figure 4. Updated Model after 3 Weeks

Adding Personality

To incorporate the Subject's personality into the model, the analyst must assess the Subject's position on personality measures and relate the variables representing action characteristics (or behavioral proclivities) to the hypothesized actions. The relationships between measures, personality variables, and linking variables are fixed, based on previous research, analyses by HumRRO researchers, and estimates by Intelligence Community psychologists.

Figure 5 shows the resulting model after personality was incorporated. The situational model (on the left) is connected to the personality model (on the right), using four of the six action characteristics. Each link between the hypothesis node and one of the action characteristics is associated with a conditional probability table that describes how the hypothesized actions differ with regard to that specific characteristic. The fact that two characteristics were not linked to the hypothesis node indicates that the actions did not differ with regard to those two characteristics. In addition, the analysts enter as much personality information as is available on the Subject. The assessments of the analysts are shown by the probability distributions in the personality nodes on the right side of Figure 5. The results of this effort modify the action probabilities from the ones that were based on situational factors only.

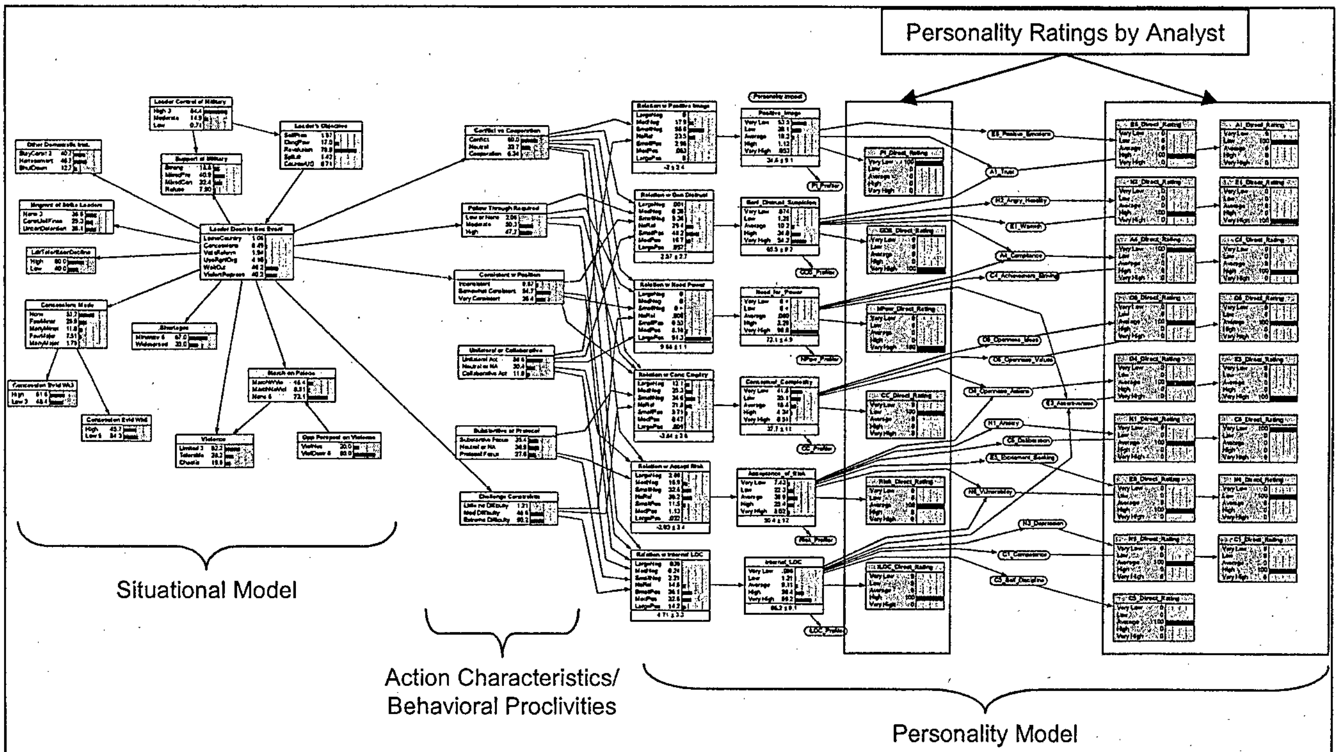

Figure 5. Integration of Situational and Personality Models

Performing "What If" Analyses

"What if" analyses are defined as tests of a model made by setting model parameters to see (a) how the changes in antecedent variable affects the outcome, and (b) if the results at that setting make sense. In addition, comparisons are made across multiple "what if" tests to see how changes in antecedents affect the relative results of the model from different settings and how they may make relative sense.

For example, we would move the probability setting on one of the situation variables from one extreme to another to observe the impact on the probabilities of the hypothesis. We would also compare the results of this analysis to those for other variables, first singly to observe the relative magnitudes of effect one variable makes with respect to the others. Then we compare the effects introduced by interactions among the situation variables. When we find results that do not make sense, we check for changes in the probability tables that would produce the results the analysts feel make sense. Sometimes, the analysts desire to make the changes to the probability tables; other times, they prefer to leave the probability tables as they were since they make more sense than the desired results. The software is very flexible in handling these calibrations and instantaneous in revealing results of multiple "what if" propositions.

Assessing the Sensitivity of Variables

In most Bayesian network software implementations, the user can designate a node and calculate the mutual information between the selected node and other nodes, one at a time. This calculation identifies (based on the mutual information metric) the relative impact that changes in the probabilities of other notes will have on the probabilities of the designated node.

Summary and Conclusions

In the last two years we have built the following models while working with teams of intelligence analysts and expert consultants:

- Invasion
- National strike
- Domestic threat *
- Missile testing
- Support for the Global War on Terrorism
- Dispute over contested territory
- Peace/cease-fire negotiation *
- Use of WMD *
- Monetary devaluation *
- Establishment of a new caliphate*
- Operational planning in a terror cell*

Those models marked with an asterisk (*) are forward-looking models for which the answer was not known when the model was built. The models vary in many ways:

1. The number of hypothesis nodes (discussed earlier),
2. The number and complexity of causal relations from nodes addressing US and other major country actions to the hypothesis nodes,
3. The number of relations between perceived reactions of the US and other major powers and the hypothesis nodes, and

4. The number and complexity of indicator variables that have arcs entering them from the hypothesis nodes

We plan to compare the predictions of these models to actual events to estimate the validity of the models. The models without asterisks were post-dictions of historical events. Although these models cannot be validated in the same sense as the forward-looking models, we will investigate the extent to which a model of a historical event can be applied to a similar situation with a different Subject.

Some of these models have proven very useful and resulted in published papers for consumers within the intelligence community. Other models have less useful. No group has said the model building process was a waste of time.

The APOLLO program, underway for three years now, is currently delivering a software-based tool to intelligence analysts that supports the development of Bayesian network models to address a wide range of situations in which a leader is making a decision, the effects of which will evolve over several weeks/months. A library of models has been under development during this time period as a proof of concept and as a resource for analysts to use as part of bootstrapping their efforts. The models span many different topic areas (invasions, national strikes, missile testing, weapons of mass destruction, and economics).

Automating the Integration of Reports

In future research, the Bayesian network will be tied into AIPSA (Automated Intel Processing for Situational Awareness) being developed by the Pacific Northwest National Laboratory (PNNL), which is based on the INSPIRE engine. AIPSA will sort through incoming all-source intelligence reports and Web documents using the analysts' favorite search engine, rank their relative salience to each situational variable, and captures the source information for later user and management review. The analyst then updates – manually or with partial automation (available in 2006) – the predictive model. As a result of the evidence changing the model, the APOLLO software will recompute the probabilities and alert the analyst or others when the outcome probability crosses a user-selected threshold based on new evidence.

To support the production process and to add efficiency, the evidence (source documents) supporting each version of the Bayesian network, the entire model, the probabilities associated with the variables, and any annotations the analyst makes are stamped with date and user and stored for future editing or reference.

Updating the Personality Model and Adding Culture

Although the personality model provides a very general framework for representing relationships between leader personality and behavioral proclivities, the relationships represented within this framework were based on the judgments of a relatively small number of experts. We are currently completing an expert judgment study that provides a more comprehensive view of the relationship between personality and behavioral proclivities. The strength of these relationships was assessed by more than 40 experts on leadership in political, military, and business settings. Based on the results of the study, we will revise both the content and the links included in the personality model.

In addition, we are conducting research to represent cultural factors in the Bayesian networks. Our initial work represents differences in leader personality distributions as a function of national culture. Future research will investigate other links between culture and leader decisions, such as direct links between cultural variables and behavioral proclivities.

Improving the Model Building Process

There are tentative plans to develop to add to the current model building process, which consists of reviewing past models and template models of situations addressed in the past. These tentative plans include developing an "expert model critiquer" that could be engaged by analysts to review a draft model and suggest areas where improvement might be made or more work might prove fruitful.

Providing an Explanatory Capability for Specific Results of the Model

There are tentative plans to build upon limited research in the Bayesian network community and develop the capability to provide verbal explanations for the analyst to use in reporting as a means of "explaining" why specific model results are what they are.

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